in boiling up an extremely thick syrup. Add to this the crumbling in of the crater-sides, their pulverization and ejection, and we have the picture of a typical paroxysmal eruption, tending towards an explosive one, of an obsidian volcano. H. J. JOHNSTON-LAVIS.

Naples, November 3.

Since writing the above, I have received the following letter from Mr. Narlian, which will form a fitting appendix to his former one read at the British Association, and published in the *Times* and elsewhere.

"*Lipari, Italy, November* 3, 1888.

"MY DEAR DR. JOHNSTON-LAVIS,—I have your kind note, for which I thank you. Our crater (*i.e.* Vulcano) is still in a very active condition. The eruptions succeed each other nearly every minute or two. Columns of thick black ashes are ejected to heights that cannot be less than 15,000 feet. The stones, red hot, are also thrown out in immense quantities and to great heights. Sometimes these eruptions are accompanied by loud detonations, which are indistinguishable from those of a gun, only they are so overpoweringly loud that at Lipari they are heard as if a piece of 100 tons had gone off near at hand. Till now there is no lava, and we hope there will not be any.

"I observe a difference in the ejected matter: in the beginning of the eruption they were stones, in time they began to show a burned calcined appearance, became quite black and friable by the action of the fire, and now they are nearly pumice of a dark and rough kind.

"I shall be glad to send you some few specimens by the first boat for Naples.

"I am, dear Sir,
"Yours faithfully,
"A. E. NARLIAN."

This prolonged activity is a most interesting phenomenon, and two explanations are open to us—viz. either the supply of igneous magma has increased, and the volcano is passing from the solfataric stage to a strombolian or Vesuvian phase, or the supply of dissolved H_2O in the magma extends to great depths, or is derived from a very large mass of magma. The change in the ejectamenta would rather point to the latter; as if, the first boiled paste being ejected, the more aquiferous paste from greater depths was undergoing discharge of its vapour. This may possibly be followed by the eventual outpour of lava, indicating the arrival at the surface of still deeper magma, comparatively poor in dissolved H_2O, so that the view of an obsidian stream may be in store for us before long—an event of considerable importance to vulcanological science. H. J. JOHNSTON-LAVIS.

NOTES.

WE lately noted that Mr. J. F. Duthie, Director of the Botanical Department, Northern India, had accompanied the recent military expedition to the Black Mountain country. The Black Mountain forms the northern boundary of the district of Hazara, which forms a long narrow valley, bounded on the west by Cashmir. Extending far into the heart of the outer Himalayan range, it is shut in on either side by mountains, rising to 17,000 feet. The flora is almost wholly unknown. But the time of year was unfavourable for botanical collecting, and Mr. Duthie writes to Kew: "I did not manage to find much of botanical interest on the Black Mountain; excepting the fine bits of forest, composed of *Abies Webbiana* and *Pinus excelsa* on the crests of the mountain, the country is barren in the extreme."

THE Kew Museum has lately received a choice collection of interesting objects from Corea, collected and brought home by Mr. T. Watters, who was Acting Consul in that country from January 1887 to June last. The specimens in question, which consist of hand-screens, fans, &c., made of paper from the paper mulberry (*Broussonetia papyrifera*, Vent.), together with samples of the paper itself, sun-blinds made of split bamboo, &c., illustrate in a remarkable degree the extreme neatness and accuracy of the Coreans in their handicrafts. The following are some of the specimens received and now exhibited in the Kew Museum. A series of different qualities of paper, all made from the bark of the paper mulberry. These comprise plain white or cream-coloured papers of various degrees of finish, used for drawing, writing, packing, &c.; also coloured papers such as are used by the people for writing birthday missives upon. It would seem that the Coreans, like the Japanese, use paper very extensively for a great variety of purposes. Thus, for fans, the handles of which are delicately ornamented, as well as for hand-screens, tobacco-pouches, coverings for hats in wet weather, paper is equally applicable; for the latter purposes, however, it is steeped in oil, which makes it thoroughly waterproof. The hand-screens are made by first forming a foundation of thin strips of split bamboo radiating from the handle, which is afterwards covered so completely on both sides with a thin paper film and varnished that a strong and durable article is the result. Some of the hand-screens presented by Mr. Watters to the Kew Museum were given to him by the King, and are of much finer workmanship than those that are purchasable. The oil-steeped paper tobacco-pouches and hat-coverings are a close imitation of oilskin; the latter, which when opened is cone- or tent-shaped, is used by all classes except the peasantry, even including the soldiers. The Corean boy's kite, which is also made of *Broussonetia* paper, consists of a piece of paper about a foot square with a circular hole in the middle, kept in form by thin strips of bamboo; a thin string is attached to each corner and brought together and connected to a single string, which is wound upon a wooden windlass. The perfection of splitting bamboo into thread-like strips seems to be divided equally between the Chinese and the Coreans, judging from a remarkably fine example of a blind which forms one of the exhibits. These very fine blinds are said to be used only by high mandarins, and the coarser kinds by the lower classes. Another illustration of very fine work is in the utilization of split rattans in the manufacture of articles of clothing, an undershirt and cuffs of very open ornamental workmanship being made entirely from this material, which is both soft and pliable. These shirts are said to be used next the skin in hot weather to prevent the oute shirt adhering to the body.

MR. J. S. JAMESON, of the Emin Pasha Relief Expedition, who died of fever at Bangala Station, on August 17 last, had accumulated a number of carefully-selected trophies and objects of natural history. These objects have been brought together at 166 Piccadilly, and arranged by Mr. Rowland Ward, so that they may be accessible to naturalists, and to his friends, who have been invited to view them to-day.

THE Russian Geographical Society has just published an "Instruction for Observations upon Shifting Sand Regions." The paper was carefully prepared by a Committee of persons thoroughly acquainted with the subject, and might with advantage be translated and communicated to other Geographical Societies.

AN important addition to school laboratories has just been completed at Eastbourne College, where the science teaching is undergoing great development. The laboratory, which has just been built there, affords working accommodation for twenty-four students, and has been thoroughly well fitted. The working benches are ranged down each side of the length of the room, and are all fitted with gas and water; and ample storage room is provided by four capital cupboard-cases. An excellent lecture-table occupies the usual position; the sand-bath and still are of copper, and heated by Fletcher's burners. There is also a convenient master's room, which, when finished, will be very complete.

PROF. H. G. SEELEY, F.R.S., is about to deliver a course of lectures on the practical study of the geology of the country round London. This course is given at the request of students of the London Geological Field Class; and information concerning the lectures may be obtained from Mr. William Dunn, 21 King William Street, Strand, W.C.

THE Penny Science Lectures at the Royal Victoria Hall for the month of December will be as follows:—December 4, on "Nature's Hot Springs," by Dr. S. Rideal; December 11, on "Limestone Rocks and their History," by Mr. E. Wethered. The series will begin again on January 22, 1889.

AT a *conversazione*, given by the Oxford University Junior Scientific Club, on Friday, November 23, in the University Museum, Prof. Milnes Marshall, of the Owens College, delivered a lecture on "Animal Pedigrees," which was highly appreciated by a numerous company of members of the University and their friends. Later in the evening Colonel Gouraud introduced and explained the new Edison phonograph. The members of the Club further entertained their guests by varied scientific exhibits and demonstrations, while the band of the 60th Royal Rifles enlivened the proceedings with music.

THE Duchess of Albany has consented to become Patroness of the Sanitary Institute.

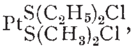
A GIGANTIC stalactite cave has been discovered near Rübeland, in the Harz Mountains, surpassing the neighbouring Bauman's Cave in size and beauty. Some excellent photographs of different parts of the cave were taken by Dr. Max Müller, of the Brunswick Technical High School, by means of the electric light. These photographs are shortly to be published, accompanied by explanatory notes by Prof. Kloss, of Brunswick. The cave is to be lighted by electricity, and opened to the general public next year, after precautions have been taken to keep it in its present perfect state.

DURING the last summer Dr. Otto Zacharias examined carefully the crater "Maare" (lakes) of the volcanic Eifel. They are inhabited by numerous species of Copepoda, Daphnidæ, Radiolaria, Rotifers, water mites, and insect larvæ. The largest of the "Maare," the Laacher See, which measures about seven miles in circumference, contains a special fauna. Besides this lake, Dr. Zacharias examined four others: the Pulvermaar, Holzmaar, Gemündener Maar, and Schalkenmehren Maar.

AT the meeting of the Royal Meteorological Society on November 21, Dr. A. Riggenbach, of Basle, read an interesting paper on a method of photographing cirrus clouds. Great difficulty is experienced in obtaining photographs of cirrus clouds, the reason being that the blue light of the sky acts with nearly the same actinic energy as the white light of the clouds on the sensitive silver salts of the plate. What is wanted is that this blue light of the sky should be dulled, the light of the clouds being left unaffected, and this can be done by means of the analyzer of a polarizing apparatus. The light from the blue sky is partly polarized, and to the largest extent at the points which are situated 90° from the sun; the plane of polarization passing through the points looked at, the sun, and the eye of the observer. On the other hand, the light coming from a cloud is only polarized to a slight extent. Having spoken of what can be done by the use of a Nicol's prism, Dr. Riggenbach went on to say that we might substitute for a Nicol's prism a dark mirror, a painter's mirror, or, best of all, a plate of obsidian. If such a plate be held so that the plane which passes through the cloud, its reflected image, and the eye, is normal to the line from the observer to the sun, the mirror extinguishes the polarized light from the sky almost completely, and the reflected image of the cloud comes out sharp on a dark background. If such an obsidian plate be fixed before the lens of a photographic camera, so that its plane is inclined at an angle of 33° to the optical axis of the lens, and the camera be placed so that the sun's rays shine perpendicularly on one of its sides, we then turn the whole apparatus round, in the direction in which the sun lies, as an axis, until a cirrus cloud is visible in the camera. If a sensitized plate be inserted, a picture of the cloud can be produced under the most favourable conditions possible. A still simpler mode of obtaining such cloud pictures is to use the surface of a lake as a polarizing mirror. The best clouds for such a purpose are those at sunrise or sunset, at an altitude of about 37°, and in an azimuth either greater or less than that of the sun by 90°.

THE North Atlantic Pilot Chart for November states that the most noteworthy disturbance during October was a West Indian hurricane which developed near Yucatan on the 9th, and reached the south coast of Long Island on the 12th. The tracks of all the depressions moving eastward from the American coast during the first half of the month lay well to the northward of the normal path until reaching the 55th parallel. This is very interesting in connection with the persistence with which an energetic area of high barometer lingered over the middle of the Atlantic, and affords a good illustration of the tendency of areas of low pressure to avoid those of high. Only one iceberg, near Belle Isle, was reported.

WE have received the Report of the Meteorological Service of the Dominion of Canada for the year 1885, which shows continual progress and improvement in the various departments. In addition to the Annual Reports, containing the results for numerous stations, a Monthly Review is published giving a general *résumé* of the weather throughout the Dominion, and an analysis of the daily forecasts and storm warnings. The weather signals carried on the railway cars are much appreciated, both by the farming community and the general public. New stations are established in the more remote districts as opportunities offer, and many valuable observations are also obtained along the line of the Canadian Pacific Railway, in regions where it is difficult to get observers other than the station officials.

TWO fine series of salts of two new platinum bases containing sulphur and organic radicles have been prepared by the Swedish Professor Blomstrand and his assistants, of Lund. They will form a striking addition to the now large number of these remarkable platinum compounds, which have been obtained since the preparation of the first of their class, the well-known green salt of Magnus, in 1828. When a solution of potassium platinous chloride, K_2PtCl_4, is shaken with two molecular equivalents of ethyl sulphide $(C_2H_5)_2S$, a quantitative precipitation of a yellow chloride, of the composition $\mathrm{Pt}\begin{smallmatrix}\mathrm{S(C_2H_5)_2 \cdot S(C_2H_5)_2Cl} \\ \mathrm{Cl}\end{smallmatrix}$, occurs. On treating this somewhat complex substance suspended in water with another two equivalents of ethyl sulphide, the whole eventually dissolves, with the exception of a small quantity of an oily substance, which appears to be formed as a secondary product. On allowing the separated clear liquid to stand, it gradually deposits crystal crusts of greenish-yellow monoclinic tables of the chloride of the first new base, $\mathrm{Pt}\begin{smallmatrix}\mathrm{S(C_2H_5)_2Cl} \\ \mathrm{S(C_2H_5)_2Cl}\end{smallmatrix}$. In a similar manner, Prof. Blomstrand has obtained the bromide, $Pt[S(C_2H_5)_2Br]_2$, which crystallizes in reddish-yellow monoclinic prisms; and the iodide, which resembles the bromide very closely, but forms beautiful dark-red monoclinic crystals of considerable size. In addition to these well-defined halogen salts, the nitrite was obtained in large colourless rhombic crystals ; the sulphate, $\mathrm{Pt[S(C_2H_5)_2]_2SO_4 + 7H_2O}$, in exceptionally large crystals exhibiting a great number of faces ; and also the nitrate in very soluble crystals. The halogen salts of the group are readily transformed into the more stable platinic compounds, which are found to be much more difficultly soluble. Thus the chloride, $\mathrm{Cl_2Pt[S(C_2H_5)_2Cl]_2}$, was obtained in the form of yellow tables and prisms belonging to the triclinic system. The bromide forms red monoclinic prisms, and the iodide, perhaps the prettiest salt of the whole series, crystallizes from chloroform in dichroic prisms, which appear dark red by transmitted, and dark blue by reflected, light. The second series of salts are precisely analogous, but contain the radicle methyl instead of ethyl. It is interesting to note that Prof. Blomstrand was successful in isolating the base of the second series itself, $\mathrm{Pt[S(CH_3)_2]_2(OH)_2}$, as a yellow, strongly alkaline liquid. Between the two series, an interesting mixed sulphine-chloride was obtained, containing both ethyl and methyl,  $\mathrm{Pt}\genfrac{}{}{0pt}{}{\mathrm{S(C_2H_5)_2Cl}}{\mathrm{S(CH_3)_2Cl}}$, by the addition of two equivalents of methyl sulphide to the yellow chloride first mentioned above. It will be readily seen that the work thus briefly reviewed forms a most valuable contribution to our knowledge of the platinum bases.

A LIST of the writings of Dr. Asa Gray, chronologically arranged, with an index, has been printed as an appendix to vol. xxxvi. of the *American Journal of Science*, and is also published separately. The compiler has done his work with great care.

IN an interesting paper on "Musical Sands," Mr. C. Carus-Wilson has discussed the cause of the remarkable sonorous properties exhibited by the sands of various localities, a subject which was referred to in this journal on August 30 and September 27 of the present year. Mr. Carus-Wilson gives the details of numerous experiments. Some of them are of a very ingenious character, which lead him to the conclusion that the vibration of the individual sand-grains is brought about by friction, and that it is the cumulative effect of numerous vibrating particles of the same size that becomes audible. This conclusion differs in some respects from the theories which have been put forward by some other investigators of these very curious phenomena.

THE first part of a useful "Introduction to Entomology," by J. H. Comstock, has been published at Ithaca, U.S.A. The groups of insects have been fully characterized, so that their relative affinities may be learned ; and much space has been given to accounts of the habits and transformations of the forms described. The work contains many original illustrations.

A LITTLE book, by Mr. W. Mawer, containing a brief account of the life and discoveries of Darwin, has just been issued by Messrs. Swan Sonnenschein and Co. The volume is likely to be of interest to young people, for whom it has been specially written.

IN the Administration Report of the Madras Government Central Museum for the year 1887-88, Mr. Thurston, the Superintendent, speaks of two tours which he made during the year on behalf of the Museum, viz. to Tuticorin and the Nílgiris. At the former place great assistance was rendered by Captain Phipps, Port Officer, in placing boats and divers at his disposal. Large collections, illustrative of the marine fauna, were made, mainly through the medium of native divers, who displayed no little skill, and some of the specimens, *e.g.* the entire collection of Sponges and Echinoderms, have been sent to the British Museum (Natural History), for investigation and report. The results of this tour will be published after Mr. Thurston has made a further tour of the Gulf of Manaar. During his tour on the Nílgiris a large area of both the plateau and slopes was explored, and large collections of birds, reptiles, butterflies, &c., were made, but as he only returned to Madras a few days before the termination of the official year, he reserves a list for his next annual report.

THE current number of the *Asiatic Quarterly Review* contains an article by Captain A. C. Yate on the Shan States, in which reference is made to the ethnology of the obscure region bounded on the west by Burmah, on the north and north-east by China, on the east by Tonquin, and on the south by Siam and the Karennee. Of the Shans he has a very low opinion : he describes them as sordid and lazy, they live in extreme poverty, they are not brave, and their foot is yet barely on the lowest rung of the ladder of civilization. Still, they are somewhat ahead of the tribes around them. They have a literature : Captain Yate says it lies about dirty and uncared for in pagodas, priests' houses, and travellers' rest-houses. Amongst the other tribes inhabiting the same region are the Palaungs, the Red and White Karens, Kakyens or Kachins, Dunoos, Laos, Was, Kaws, Chins, Yins or Yeíns, Yindalaings, Padaungs, Taungthus, Müsüs, and Kakins. All these are believed to speak their own dialects, but none of them have a written language. The Palaungs, Kachins, and Laos are the more important of these. The Kachins are extending all over the region, and are hated and feared by the Shans. They worship or propitiate certain evil forces in Nature which they call "nats." Captain Yate gives some curious details in regard to this and other tribes, but his aim is rather to describe what they are as he saw them, than to discuss the ethnological problems connected with this region and its races and fragments of all but extinct peoples.

IN a paper in the current number of the Journal of the Anthropological Institute, Mr. J. Allen Brown states, on the authority of Mr. Carlyle, late of the Archæological Survey of India, that some few of the rudest aboriginal tribes of the wildest central parts of India still practise a modified and partial sort of tattooing, but only with deep blue or other dark or grey colour, never with red. Hindus use red and white, and sometimes yellow colours superficially, without incisions, which will wash off, as religious sectarial caste marks on their foreheads. These are the only instances, so far as Mr. Brown can learn, where such pigments are now used either for embellishment or religous symbols in India.

WE have received the second part of vol. iii. of the Proceedings of the Linnean Society of New South Wales. The following are among the contents : on additional evidence of the genus *Ichthyosaurus* in the Mesozoic rocks ("Rolling Downs Formation") of North-Eastern Australia, by R. Etheridge, Jun. (Plate vii.) ; on additional evidence of the occurrence of *Plesiosaurus* in the Mesozoic rocks of Queensland, by R. Etheridge, Jun. (Plate viii.) ; description of a new *Tripterygium* from Port Jackson, by E. P. Ramsay and J. D. Ogilby ; notes on the Mueller Glacier, New Zealand, by Captain F. W. Hutton (Plates ix. and x.) ; the insects of King's Sound and its vicinity (Part 1), by William Macleay ; Australian indigenous plants providing human foods and food-adjuncts, by J. H. Maiden ; geographical notes in Malaysia and Asia, by the Rev. J. E. Tenison-Woods ; Diptera of Australia (Part 2, the Sciaridæ), by F. A. A. Skuse (Plate xi.) ; note on sympathy and foster-parentage among birds, by E. G. W. Palmer ; on some new and rare Hydroida in the Australian Museum Collection, by W. M. Bale (Plates xii.–xxi.) ; notes on Australian Coleoptera, with descriptions of new species, by the Rev. T. Blackburn ; the development and structure of the pineal eye in *Hinulia* and *Grammatophora*, by W. J. McKay (Plates xxii.–xxiv.).

IN his note on sympathy and foster-parentage among birds, Mr. Palmer tells a curious story of a wood-duck and a hen.

"Some time ago," he says, "a boy brought in an egg found near a waterhole, which was placed with other eggs under a sitting hen, and in due course hatched out a wood-duck. The wood-duck was reared among a clutch of chickens, was as well tended as her other chicks by the mother hen, and reached adult age. On one occasion a hen brought out a brood of chickens, and the wood-duck kept in close companionship with the hen and chicks for several days, until the hen took umbrage at the duck's constant attendance, and several fights between the hen and duck ensued. Eventually the duck drove away the hen, and took sole charge of the chickens throughout the day, the hen following round disconsolately till night-fall each day, when the duck surrendered her charge, allowing the mother to brood over them at night, but again taking charge of them in the morning. This continued till the chickens were able to take care of themselves."

THE writer of the article on "The Opening of the Pasteur Institute" (NATURE, November 22), informs us that by an oversight a misprint occurs on p. 74, in the first line of the second paragraph. Class *C.* should read Class *A.*

THE additions to the Zoological Society's Gardens during the past week include a Black-eared Marmoset (*Hapale penicillata*) from South-East Brazil, presented by Miss B. Pollock; a Malbrouck Monkey (*Cercopithecus cynosurus*) from West Africa, presented by Mr. David Baumann; a —— Toad (*Bufo* ——) from California, presented by Mr. D. E. Cardinall; a North American Turkey (*Meleagris gallo-pavo*) from North America, presented by Mr. F. J. Coleridge Boles; a Tawny Owl (*Syrnium aluco*), European, deposited.

OUR ASTRONOMICAL COLUMN.

COMET 1888 *e* (BARNARD, SEPTEMBER 2).—Dr. L. Becker, who has recently computed elements for this comet by the method of variation of the distances, finds (*Dun Echt Circular*, No. 164) that the most probable orbit is hyperbolic in character, the residuals for the intermediate observations being much larger for the most suitable parabola than for the hyperbolic orbit.

The elements are as follow :—

$$T = 1889 \text{ January } 29{\cdot}90453 \text{ G.M.T.}$$

$$\left.\begin{aligned} \pi - \Omega &= 339^\circ\ 54'\ 32''{\cdot}1 \\ \Omega &= 357\ \ 15\ \ 59{\cdot}1 \\ \iota &= 166\ \ 22\ \ 24{\cdot}3 \end{aligned}\right\} \text{Mean Eq. } 1888{\cdot}0.$$

$$\log q = 0{\cdot}2595204$$
$$\log e = 0{\cdot}0135800$$

Ephemeris for Greenwich Midnight.

1888.	R.A. h. m. s.	Decl. ° ′	Log Δ.	Log *r*.	Brightness.
Nov. 29	2 28 2	5 57·3 S.	0·0501	0·2971	12·1
Dec. 1	2 15 18	6 21·0			
3	2 3 9	6 41·4	0·0669	0·2928	11·4
5	1 51 40	6 58·4			
7	1 40 50	7 12·2	0·0887	0·2887	10·5
9	1 30 42	7 23·2			
11	1 21 15	7 31·5	0·1131	0·2847	9·6
13	1 12 29	7 37·5			
15	1 4 21	7 41·2 S.	0·1390	0·2810	8·7

The brightness on September 2 has been taken as unity.

Dr. Berberich has, however, computed parabolic elements using an observation made at Karlsruhe on October 28, the ephemeris from which satisfies well an observation obtained at Rome as recently as November 7.

According to Dr. Becker's ephemeris, the comet will pass within 1½′ of a bright nebula, 100 ♄ I Ceti, a little before midnight on December 10, and as the head of the comet is of very considerable size, the nebula will be completely involved in it. The moon will be near setting, so that, though the comet will be low, about 75° Z. D., spectroscopic observations might be obtained if the night were clear. Dr. Berberich's elements would place the transit some three hours later, when the comet would have set to English observers, but makes the transit nearly a central one.

COMETS FAYE AND BARNARD, OCTOBER 30.—The following ephemerides for these objects for Berlin midnight are by Drs. Lamp and Spitaler respectively (*Astr. Nach.*, No. 2867) :—

	Comet 1888 *d* (Faye).		Comet 1888 *f* (Barnard, Oct. 30).	
1888.	R.A. h. m. s.	Decl. ° ′	R.A. h. m. s.	Decl. ° ′
Dec. 1	8 14 34	2 29·2 N.	10 19 27	8 50·8 S.
3	8 14 36	2 12·8	10 20 47	8 16·9
5	8 14 30	1 57·2	10 21 59	7 41·5
7	8 14 15	1 42·6	10 23 4	7 4·4
9	8 13 52	1 28·9	10 24 0	6 25·8
11	8 13 21	1 16·2	10 24 50	5 45·8
13	8 12 42	1 4·5	10 25 32	5 4·2
15	8 11 55	0 53·9	10 26 4	4 20·7
17	8 11 1	0 44·4	10 26 28	3 35·5
19	8 10 1	0 36·1 N.	10 26 45	2 48·8 S.

The brightness on December 19 of Faye's comet is 1·8 that of the brightness at discovery; of Barnard's, 0·9. Both comets change but slowly in brightness, as the distance from the earth is diminishing, whilst the distance from the sun is increasing.

THE SATELLITE OF NEPTUNE.—Mr. A. Marth pointed out in the *Monthly Notices* (vol. xlvi. p. 506), some two years ago, that the values for the inclination of the orbit of the satellite of Neptune and its ascending node, as deduced from the observations obtained in Malta in the years 1852 and 1864 by Lassell and Marth, and again at the Washington Naval Observatory from 1874 to 1884, show a well-marked, progressive, and regular change. Referring these values to the plane of the orbit of the planet, they are as follows :—

Date.	*n.* °	*i* (motion considered direct). °
1852	176·20	148·33
1864	180·41	146·19
1874	182·59	144·04
1883	184·31	142·38

Mr. Marth offered no theory by which to account for this change, but begged for continued observations. Prof. Asaph Hall also has more recently urged the necessity for further observation, and by fresh observers, avowing at the same time his suspicion that these changes are due to systematic errors in the observations. But M. Tisserand, in a late communication to the Academy of Sciences of Paris, shows that the changes can easily be explained by the theory of a slight flattening of the surface of Neptune. In this case the angle between the plane of the planet's equator and that of the orbit of the satellite will be constant, and the pole of the orbit will revolve in a small circle round the pole of the planet, a complete revolution taking more than 500 years. The inclination of the orbit of the satellite will be considerable, probably greater than 20°; but the flattening of the surface of Neptune can only be slight, too small to be detected by direct measurement. Further observations may enable the amount of the inclination to be more exactly determined, and, at the same time, will show whether the changes in question are due or not to this one cause alone.

ASTRONOMICAL PHENOMENA FOR THE WEEK 1888 DECEMBER 2-8.

(FOR the reckoning of time the civil day, commencing at Greenwich mean midnight, counting the hours on to 24, is here employed.)

At Greenwich on December 2

Sun rises, 7h. 48m.; souths, 11h. 49m. 49·0s.; sets, 15h. 51m.: right asc. on meridian, 16h. 36·8m.; decl. 22° 5′ S. Sidereal Time at Sunset, 20h. 39m.

Moon (New on December 3, 10h.) rises, 6h. 3m.; souths, 10h. 56m.; sets, 15h. 39m.: right asc. on meridian, 15h. 42·7m.; decl. 15° 23′ S.

Planet.	Rises. h. m.	Souths. h. m.	Sets. h. m.	Right asc. and declination on meridian. h. m.	° ′
Mercury	6 26	10 51	15 16	15 37·8	18 26 S.
Venus	10 41	14 27	18 13	19 14·9	24 21 S.
Mars	11 18	15 24	19 30	20 11·8	21 25 S.
Jupiter	8 12	12 12	16 12	16 58·9	22 17 S.
Saturn	21 20*	4 46	12 12	9 32·3	15 38 N.
Uranus	3 6	8 31	13 56	13 17·3	7 30 S.
Neptune	15 22	23 6	6 50*	3 55·4	18 36 N.

* Indicates that the rising is that of the preceding evening and the setting that of the following morning.